

NON-PUBLIC?: N  
ACCESSION #: 9207290094  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Calvert Cliffs, Unit 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000318

TITLE: Manual Reactor and Main Turbine Trip Due to Failed Expansion  
Joint in 21 Main Condenser  
EVENT DATE: 06/24/92 LER #: 92-003-00 REPORT DATE: 07/24/92

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: R. C. Gradle TELEPHONE: (410) 260-3738

COMPONENT FAILURE DESCRIPTION:  
CAUSE: B SYSTEM: SG COMPONENT: EXJ MANUFACTURER: X999  
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

#### ABSTRACT:

On June 24, 1992, at 3:09 a.m., Calvert Cliffs Unit 2 was manually tripped due to a rapid loss of Main Condenser vacuum. The low vacuum condition was caused by the failure of the 21 Main Condenser Expansion Joint. Unit 2 was at 100 percent power at the time of the event.

This event did not result in any significant safety consequences. The immediate cause of the event was air in-leakage through the torn expansion joint belt of 21 Main Condenser.

Unit 2 was placed in COLD SHUTDOWN (MODE 5) on June 25, 1992. An improved design belt was installed in 21 Main Condenser Expansion Joint. A new inspection procedure for the expansion joints has been implemented.

A preventive maintenance procedure to periodically replace the expansion joints will be implemented.

END OF ABSTRACT

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## I. DESCRIPTION OF EVENT

On June 24, 1992, at 3:09 a.m., Calvert Cliffs Unit 2 was manually tripped due to a rapid loss of Main Condenser vacuum. The low vacuum condition was caused by a failure of the 21 Main Condenser Expansion Joint. At the time of the event, Unit 2 was at 100 percent power. There were no other structures, components, or systems that were inoperable at the start of the event that contributed to the event.

Calvert Cliffs Unit 2 has one three-shell, single pass, deaerating-type Main Condenser (Unit 1 is identical). Each condenser shell receives exhaust steam from one of three low pressure turbines. A belt-type flexible rubber expansion joint connects each low pressure turbine to its condenser shell. The belt is protected from the turbine exhaust by a stainless steel liner. Seal water is maintained around the outside of the rubber belt. A seal water low level alarm is provided for each expansion joint and is connected to a common annunciator panel in the Control Room.

On June 24, 1992, at 3:05 a.m., Unit 2 Control Room personnel received the expansion joint low level alarm. The Control Room Operator directed the Turbine Building Operator (TBO) to fill the expansion joint seals and investigate the alarm condition.

At 3:06 a.m., low vacuum alarms were received and acknowledged on 21 and 22 Main Condensers. Control Room personnel immediately implemented Abnormal Operating Procedure (AOP)-7G, "Partial Loss of Condenser Vacuum.

of The Control Room Operator started the fourth (standby) Condenser Air Removal Unit and verified all four units operating. The Reactor Operator commenced a main turbine load reduction. At 3:09 a.m., with main condenser vacuum still decreasing, the Control Room Supervisor directed that the reactor and main turbine be manually tripped per AOP-7G.

Emergency Operating Procedure (EOP)-0, "Post-Trip Immediate Actions," was initiated when the Unit was tripped. All safety systems worked properly.

Following the turbine trip the steam generator feed pumps tripped on high discharge pressure due to the quick closure signal to the feedwater regulating valves and the response of the pumps control system.

Auxiliary feedwater (AFW) flow was initiated.

With the plant stabilized, 21 Main Condenser vacuum remained lower than 22 or 23 main condensers. Plant personnel identified the leaking area of the expansion joint by detecting a sizable amount of air being drawn into a particular location of the expansion joint. Seal water could not be added fast enough to the expansion joint of 21 main condenser to stop the flow of air or increase vacuum in the condenser.

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Unit 2 was placed in COLD SHUTDOWN (MODE 5) on June 25, 1992. Inspection of 21 Main Condenser on June 26, 1992 revealed a torn section of the expansion joint belt.

## II. CAUSE OF EVENT

Investigation into the event determined that the immediate cause for the rapid loss of condenser vacuum was air in-leakage through the torn expansion joint rubber belt in 21 Main Condenser. The root cause of the mechanical failure of the belt was due to aging factors along with the stress imposed on the rubber belt due to warping of 21 Main Condenser shell.

The rubber belt in 21 Main Condenser has been in service since the initial Unit 2 start-up in 1976. The belts were replaced in 22 main condenser in 1987 and in 23 main condenser in 1982 due to identified leakage concerns. The 22 and 23 main condenser expansion joint replacements were sized to accommodate the additional stress imposed by warping. In April, 1989, an independent outside agency conducted inspections of the Unit 2 expansion joints. The study concluded that the expansion joint in shell 21 would require replacement within five years. To be conservative, replacement of the expansion joint belt with an improved design was planned for the Spring 1993 Unit 2 Refueling Outage.

Unit 1 main condenser has not experienced this shell warping condition and consequently the expansion joint rubber belts are not expected to be subject to similar failures. A recently completed inspection of the Unit 1 expansion joints confirmed adequate belt integrity.

## III. ANALYSIS OF EVENT

This event is considered reportable in accordance with 10 CFR 50.73(a)(2)(iv), "Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)."

This event resulted in no significant consequences to the public health and safety. The manual trips of the Reactor and the Main Turbine were conducted as prescribed in approved plant procedures. No automatic trip signal was initiated due to the correct and prompt action of our Operations personnel.

All safety systems functioned as required. As described above, main feedwater was lost following the unit trip when the main feedwater pumps tripped due to high discharge pressure. The worst case loss of feedwater event described in the Calvert Cliffs Updated Final Safety Analysis Report is a simultaneous closure of both Main Feed Regulatory Valves from 100 percent power without Automatic Initiation of Auxiliary Feedwater (AFW) in conjunction with certain reactor protection trips. In this case, the event is terminated when the operator initiates AFW flow 10 minutes into the event. As discussed earlier, though the

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main feedwater flow was lost, AFW flow to the steam generators was promptly initiated. Therefore, there was no safety significance associated with this event.

#### IV. CORRECTIVE ACTIONS

A. The expansion joint belt in 21 Main Condenser has been replaced with one of improved design. The belt was properly sized to account for shell warping.

B. Periodic inspection of the expansion joints is being conducted using a new preventive maintenance inspection procedure. The inspections were completed for Unit 1 during the current Unit 1 outage.

C. A preventive maintenance procedure to periodically replace the expansion joints will be implemented.

D. Modifications to the Main Feedwater Control System are being evaluated to prevent unnecessary challenges to the AFW system.

#### V. ADDITIONAL INFORMATION

A. Identification of components and systems referred to in this LER:

IEEE 803 IEEE 805  
Function EIIS Funct System ID

Condenser COND SG  
Expansion Joint EXJ SG  
Turbine TRB TA  
Alarm Level LA SG  
Feedwater Pump P SJ  
Feedwater Reg Valve FCV SJ  
Auxiliary Feedwater NA BA  
Steam Generators SG TA  
Reactor Protection System NA JC

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B. Previous Similar Events

There have been no previous similar events involving a reactor trip due to a failed Main Condenser Expansion Joint.

ATTACHMENT 1 TO 9207290094 PAGE 1 OF 1

BALTIMORE  
GAS AND  
ELECTRIC

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R. E. DENTON  
GENERAL MANAGER  
CALVERT CLIFFS

July 24, 1992

U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant  
Unit No. 2; Docket No. 50-318; License No. DPR 69  
Licensee Event Report 92-003

Gentlemen:

The attached report is being sent to you as required under 10CFR50.73 guidelines. Should you have any questions regarding this report, we will be pleased to discuss them with you.

Very truly yours,

RED/RCG/bjd  
Attachment

cc: D. A. Brune, Esquire  
J. E. Silberg, Esquire  
R. A. Capra, NRC  
D. G. McDonald, Jr., NRC  
T. T. Martin, NRC  
P. R. Wilson, NRC  
R. I. McLean, DNR  
J. H. Walter, PSC  
Director, Office of Management Information  
and Program Control

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